

**FOOTWEAR SYSTEM HAVING A SOLE ADAPTABLE TO  
DIFFERENT DIMENSIONS OF SHOES**

**BACKGROUND OF THE INVENTION**

**1. Field of the Invention**

5        This invention relates to articles of footwear, more particularly to a footwear system including a sole which can be changed in dimension and shape so that it adapts to different dimensions and shapes of shoe uppers.

**2. Description of the Related Art**

10        Referring to Fig. 1, a shoe 1 typically has an outsole 12 attached to an upper 11. The outsole 12 includes a toe part 121, a shank part 122 and a heel part 123 as shown in Figure 2 and has a tread member (not shown) at the bottom thereof. In order to accommodate varying sizes of the  
15        wearers' feet, shoes are designed with different standardized sizes, such as from size numbers 5 to 12 with an interval of 1/2 between two consecutive numbers.

20        When a new series of shoes are to be manufactured, it is necessary to produce different sizes of soles to be assembled with varying sizes of shoes. As different sizes of soles require different individual molds for forming the soles, a large number of molds need to be prepared, thus resulting in considerable expenses for manufacturing shoes of different sizes. In addition, the preparation of  
25        a large number of molds for all sizes of shoes would take a lot of time which may delay the launching of shoe products into the market.

U.S. Patent No. 6,418,641, discloses a shoe which includes an upper, a shock absorbing insole affixed to the upper, a frame secured to the insole, and a sole made up of plural separate parts which are adhesively secured to the frame. The frame is provided with cutouts, whereas the separate parts of the sole are spaced apart from each other. The purposes of the cutouts in the frame and the gaps between the parts of the sole are to dissipate or minimize the reaction forces exerted on the foot upon impact. This patent suggests nothing relevant to the adjustment of the dimensions or the outline of a sole.

U.S. Patent No. 5,729,912 discloses an adjustment system for the adjustment of the dimensions of a shoe in a plurality of discrete locations of a sole of the shoe. The adjustment system is incorporated into the sole at adjustment locations defined by grooves or voids of the sole. The invention in this patent is aimed at only adjusting the width and shape of the sole of a shoe to adapt to the foot of an individual wearer, rather than different dimensions of shoes.

In order to facilitate the production of soles and to reduce the costs of preparing molds for fabricating soles, it is desirable that a series of shoes having different sizes can be manufactured by using a common mold for producing soles.

#### **SUMMARY OF THE INVENTION**

An object of the present invention is to provide a

sole which is adjustable in dimension and size to adapt to different dimensions and shapes of shoes.

Another object of the present invention is to provide a footwear system in which a series of shoes having different size numbers can be manufactured by using a common mold to produce soles.

Still another object of the present invention is to provide a sole which can be adjusted in both width and length to adapt to different sizes and shapes of shoes.

According to the present invention, a footwear system comprises: at least two uppers of different sizes having respective first sole members, each of the first sole members having a toe part, a heel part, an intermediate part, and a peripheral end surrounding the toe, heel and intermediate part, the first sole members being different at least in dimension; and a second sole member for attachment to either one of the first sole members and being adjustable at least in dimension to be adaptable to the dimensions of both of the first sole members, the second sole member having at least one hollow part whose dimension is changeable for adjustment of the second sole member. When the second sole member is attached to one of the first sole members, the hollow part is adjusted to a first width, and when the second sole member is attached to the other one of the first sole members, the hollow part is adjusted to a second width which is different from the first width.

The second sole member may be composed of a plurality

of separate sole portions. The hollow part may be a cutout formed in the second sole member or a gap defined by the separate sole portions. The overall width of the second sole members can be changed when the width of the hollow part is adjusted in a transverse direction of the first sole member. And the overall length of the second sole member can be changed when the width of the hollow part is adjusted in a longitudinal direction of the first sole member.

As described above, the second sole member which is composed of a plurality of sole portions. Although a sole having plural separate parts like the second sole member used in the present invention is disclosed in U.S. Patent No. 6,418,641, nothing disclosed in this patent suggests that such a sole can be used for adjustment of the dimension and shape of the sole so as to adapt to different sizes of shoes. In addition, while U.S. Patent No. 5,729,912 discloses an adjustment of the dimension and shape of a sole, it fails to suggest that the dimensions of a sole be adjusted to adapt to different sizes and shapes of shoes. In view of the fact that U.S. Patent No. 6,418,641 suggests nothing relating to adjustment of the dimension of a sole and that U.S. Patent No. 5,729,912 merely teaches that a sole should be adjusted in an individual shoe to adapt to the foot of an individual, the prior art never suggests that a sole be adjusted to adapt to different dimensions and shapes of shoes.

**BRIEF DESCRIPTION OF THE DRAWINGS**

Other features and advantages of the present invention will become apparent in the following detailed description of the preferred embodiments of the invention, with reference to the accompanying drawings, in which:

Fig. 1 a perspective view of a conventional shoe;

Fig. 2 a plan view of a sole of the conventional shoe;

Fig. 3 is an exploded view of a first preferred embodiment of the present invention;

Fig. 4 is a perspective view of the first preferred embodiment;

Fig. 5 is a plan view of the first preferred embodiment;

Fig. 6 is an exploded view of an alternative example of the first preferred embodiment including additionally an alignment indicator;

Fig. 7 is a perspective view of another example of the first preferred embodiment incorporating a sewing line;

Fig. 8 is a perspective view of further example of the first preferred embodiment incorporating insert pieces;

Fig. 9 shows that a second sole member of the first preferred embodiment is attached to a first sole member having a small size;

Fig. 10 shows that the second sole member of the first preferred embodiment is attached to another first sole member having a large size;

Fig. 11 is an exploded view of a second preferred embodiment of the present invention;

Fig. 12 is a perspective view of the second preferred embodiment;

Fig. 13 is an exploded view of a third preferred embodiment of the present invention;

5 Fig. 14 is a perspective view of the third preferred embodiment;

Fig. 15 is an exploded view of a fourth preferred embodiment of the present invention; and

10 Fig. 16 is a perspective view of the fourth preferred embodiment.

#### **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS**

Before the present invention is described in greater detail, it should be noted that same reference numerals have been used to denote like elements throughout the specification.

15 Referring to Figures 3 to 6, a first preferred embodiment of the footwear system according to the present invention includes a first sole member 20 and a second sole member 30. The first sole member 20 is formed as a dual-layered insole for attachment to an upper 2 and has an upper layer 21 and a lower fabric layer 22 attached to the upper layer 22 (the upper and lower layer 21 and 22 are reversed in Figures 3 to 6 as the upper 2 is upside down). The upper layer 21 may be made from a material such as PE, nylon, PU, TPU, or glass fiber, or a composite material. The material may also be any other thermoplastic or thermosetting resin, either foamed or unfoamed, or any

other nonwoven fabric, or a combination thereof. The insole or first sole member 20 has a flat top face 201 and a flat bottom face 202 which functions to assist in bonding the second sole member 30 to the first sole member 20. The

5 first sole member 20 includes a toe part 23, an intermediate part 24, a heel part 25, and a peripheral end 26 surrounding the toe, intermediate and heel parts 23, 24 and 25.

Of course, the first sole member 20 may also be used as a midsole or a combined midsole instead of an insole.

10 The top and bottom of the midsole (not shown) may be in any shape desirable for practical use. The advantage of the midsole is that the midsole may be formed with protrusions to fill the gaps formed upon adjustment of the distances between the components of the second sole member

15 30 before the second sole member 30 is attached to the first sole member 20. As such, the midsole can be assembled with the second sole member 30 precisely to form a perfect combination. If the midsole is made of a foamed material, in order to enhance the abrasion resistance against the

20 ground surface, the midsole may be preformed with an indentation to fill high abrasion resistant outsole material.

The second sole member 30 is attached to the bottom face 202 of the first sole member 20 through adhesive

25 bonding to serve as an outsole, and is composed of three sole portions, i.e. a front sole portion 31, a rear sole portion 32 and a middle sole portion 33 all of which are

provided with tread surfaces, respectively. The front, rear and middle sole portions 31, 32 and 33 may be made of different materials according to varying physical and mechanical characteristics, such as flexibility, abrasion resistance, and comfortability, etc., required by the toe, intermediate and heel parts of a shoe. The front sole portion 31 is cemented to the toe part 23 of the first sole member 20 and has a front peripheral edge 311. The second sole portion 32 is cemented to the heel part 25 and has a rear peripheral edge 321. The front and rear sole portions 31, 32 are provided respectively with cutouts 312 and 322 which generally extend along a longitudinal direction of the first sole member 20 so that the widths of the front and rear sole portions 31, 32 may be adjusted by moving inward or outward the opposite lateral sides thereof. The cutouts 312, 322 may be provided in any suitable quantity and with any suitable dimension to meet the design of shoes to be manufactured.

The middle sole portion 33 is cemented to the intermediate part 24 of the first sole member 20 between the front and rear sole portions 31 and 32. The middle sole portion 33 has left and right peripheral edges 331 which are curved and arranged to be flush with the peripheral end 26 of the first sole member 20, and left and right cutouts 332 adjacent to the left and right peripheral edges 331. The cutouts 332 permit the left and right peripheral edges 331 to move inward or outward along a transverse



direction of the first sole member 20 so that the middle sole portion 33 is adjustable in width. The second sole member 30 can also be adjusted in length along the longitudinal direction of the first sole member 20.

5 Adjustability of the dimension and shape of the second sole member 30 will be detailed hereinafter.

As shown in Figures 4 and 5, the front, rear and middle sole portions 31, 32 and 33 of the second sole member or outsole 30 are attached to the first sole member 20 and are spaced apart from one another with a gap "d1" between the front and middle sole portions 31 and 33 and with a gap "d2" between the middle and rear sole portions 33 and 32. The front and rear peripheral edges 311 and 321 of the front and rear sole portions 31 and 32 are flush with the peripheral end 26 of the first sole member 20.

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As shown in Figure 6, to facilitate assembly, the bottom face 202 of the first sole member 20 may be provided with an alignment indicator, such as aligning lines 203 which are formed through a printing process to indicate the positions at which the front, rear and middle sole portions 31, 32 and 33 should be located. By following the aligning lines 203, the second sole member 30 can be easily and rapidly assembled with the first sole members 20. Apart from the aligning lines 203, the first sole member 20 may also be provided with any other indication means suitable to identify the locations of the front, rear and middle sole portions 31, 32, 33, such as a mark which may

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be formed on the first sole members 20 during the molding process thereof.

Assembly of the second sole member 30 with the first sole member 20 should not be limited to use of an adhesive bonding process. Any conventional means suitable for securing the first and second sole members 20 and 30 may be used in the present invention. As shown in Figure 7, the second sole member 30 may be attached to the first sole member 20 by means of a sewing line 301. Apart from this, interlocking elements, such as male and female engaging elements, may be provided between the first and second sole members 20 and 30 to interconnect the same. For effective connection, an adhesive may be provided between the contact surfaces of the first and second sole members 20 and 30.

Referring to Figure 8, the footwear system of the present invention may additionally include insert pieces 34 to fill the cutouts 312, 322 and the gaps d1 and d2 of the second sole member 30. The insert pieces 34 may be formed by cutting or molding to correspond to the shapes and dimensions of the gaps d1 and d2 and the cutouts 312, 322. The material of the insert pieces 34 may be any foamed or unfoamed thermoplastic or thermosetting material, or rubber. Examples of them are PU, EVA, etc. The insert pieces 34 may be colored and formed with various shapes to provide improved aesthetic effects.

The dimension and shape of the second sole member 30 can be adjusted and changed to be adaptable to differently

sized first sole members 20 which are to be assembled with different sizes of uppers (not shown). As shown in Figure 9, when the second sole member 30 is assembled with the first sole member 20 having a small size with a length "L1", the dimensions of the overall outer periphery of the second sole member 30 must be reduced by pressing inward the peripheral edges of the front, rear and middle sole portions 31, 32 and 33 to decrease the width of the cutouts 312, 322 and 332, and the width of the gaps d1 and d2 of the second sole member 30 must be reduced to d1' and d2'. Thereafter, the front, rear and middle sole portions 31, 32 and 33 are secured to the first sole member 20 by a cementing or sewing process.

As shown in Figure 10, when the second sole member 30 is to be assembled with the first sole member 20 which has a large size number with a length "L2", the dimensions of the overall outer periphery of the second sole member 30 must be increased by stretching outward the peripheral edges of the front, rear and middle sole portions 31, 32 and 33 to increase the width of the cutouts 321, 322 and 332 and the width of the gaps d1 and d2 of the second sole member 30 must be increased to d1" and d2". Thereafter, the front, rear and middle sole portions 31, 32 and 33 are secured to the first sole member 20 by a cementing or sewing process.

As mentioned above, the second sole member 20 may be adjusted to change both the width and the length thereof

so that the second sole member 20 is adaptable to be assembled with shoes having lengths L1 and L2. Therefore, said shoes may be manufactured by using a common mold for producing the second sole members 30 thereof. As such, it is not necessary to prepare plural molds to produce individually a plurality of differently sized second sole members 30.

The advantages of the present invention will be explained further by way of examples of manufacturing a series of shoes with size numbers ranging from 8 to 11 (American grades). In this series of shoes, the size numbers of the largest and smallest outsoles are respectively 11 and 8. The differential dimensions (not exact values, only approximate values are provided for reference) between the two outsoles are as follows:

- (1) about 30mm (the differential length measured along a longitudinal direction)
- (2) 10-15mm (the differential width of a toe part measured along a transverse direction)
- (3) 15-20mm (the differential width of a heel part measured along a transverse direction); and
- (4) about 10mm (the differential width of an intermediate part measured along a transverse direction)

There are altogether seven size numbers (8, 8.5, 9, 9.5,

10, 10.5 and 11) from size numbers 8 to 11. Conventionally, outsoles for different size numbers cannot be fabricated by using the same mold. According to the present invention, the aforesaid size numbers may be divided into two groups, for example, a first group including size numbers 8, 8.5, 9 and 9.5, and a second group including size numbers 9.5, 10, 10.5, and 11. As such, the differential dimensions between the greatest and smallest sizes of the outsoles in each group are reduced to halves of the above described differential values, and are listed as follows:

- (1) about 15mm (the differential length measured along a longitudinal direction)
- (2) 5-7mm (the differential width of a toe part measured along a transverse direction)
- (3) 7.5-10mm (the differential width of a heel part measured along a transverse direction); and
- (4) about 5mm (the differential width of an intermediate part measured along a transverse direction)

Since each of the front, rear, and middle sole portions 31, 32 and 33 of the second sole member 30 can be adjusted at two opposite sides thereof, the dimensional changes needed at each of the opposite sides thereof are within the differential dimensions which may be obtained by further halving the aforesaid differential dimensions and which are stated as follows:

- (1) about 7.5mm (the differential length measured

along a longitudinal direction)

(2) 2.5-3.5mm (the differential width of a toe part measured along a transverse direction)

(3) 3.75-5mm (the differential width of a heel part measured along a transverse direction)

(4) about 2.5mm (the differential width of an intermediate part measured along a transverse direction)

Based on the above proposed dimensions, the front, rear, and middle sole portions 31, 32 and 33 of the second sole member 30 may be designed with proper deformable and adjustable characteristics. Of course, the aforesaid 8 to 11 size number series may also be divided into three groups, four groups and so on, in order to provide various designs for the second sole member 30 of the present invention.

Referring to Figures 11 and 12, a second preferred embodiment of the footwear system according to the present invention comprises a second sole member 30I which includes a front sole portion 31I, a rear sole portion 32I, a middle sole portion 33I and left and right lateral sole portions 34I. The front sole portion 31I is attached to the toe part 23 of the first sole member 20 and has a cutout 311I. The rear sole portion 32I is attached to the heel part 25 and has a cutout 321I. The two lateral sole portions 34I are attached to left and right sides of the intermediate part 24 of the first sole member 20. The middle sole portion 33I is attached to the first sole member 20 between the

front and rear sole portions 31I, 32I and between the lateral sole portions 34I. Gaps d3, d4, and d5 are formed between the front and lateral sole portions 31I, 34I, between the rear and lateral sole portion 32I, 34I, between the lateral and middle sole portions 34I, 33I. The middle sole portion 33I is so shaped that it projects partially into the cutouts 311I and 321I of the front and rear sole portions 31I and 32I, and the gaps d3 and d4. The width of the cutouts 311I and 321I and the width of the gaps d3, d4 and d5 can be adjusted to change the dimensions and shape of the second sole member 30I.

In addition to the first sole member 20 and the second sole member or outsole 30 or 30I, the footwear system of the present invention may also include a third sole member or midsole which has a one-piece structure or a multi-piece structure. Referring to Figures 13 and 14, a third preferred embodiment of the footwear system according to the present invention comprises a first sole member 20, a second sole member or outsole 30II attached to the bottom face 202 of the first sole member 20, and a third sole member or midsole 40 connected to a top face 201 of the first sole member 20. The second sole member 30II is substantially similar to the second sole member 30 of the first preferred embodiment except that the second sole member 30II additionally includes flanges 331II projecting from left and right sides of a middle sole portion 33II to the first sole member 20, and a generally U-shaped flange 321II

projecting from the peripheral edge of the rear sole portion 32II to the first sole member 20. The third sole member or midsole 40 includes a front sole portion 41, a rear sole portion 42 and a middle sole portion 43 and has substantially the same configuration as the second sole member 30II except that the third sole member 40 does not include the flanges 331II and 321II. The flanges 331II and 321II of the second sole member 30II extend from the second sole member 30III to the first and third sole members 20 and 40 and cover partially the peripheral end of the first sole member 20 and the edges of the middle sole portion 43 and the rear sole portion 42 of the third sole member 40. The dimensions of the third and second sole members 40 and 30II are adjustable like the second sole members 30 and 30I of the previous embodiments.

Referring to Figures 15 and 16, a fourth preferred embodiment of the present invention includes a first sole member or insole 20I, a second sole member or outsole 30III and a third sole member or midsole 40I. The first sole member 20I has front and rear protrusions 21I, whereas the third sole member 40I has front and rear protrusions 41I. The second sole member 30III includes left and right sole portions 31III each of which extends from a toe part 23I to a heel part 25I of the insole 20I and resembles the shape of a half of a sole. The left and right sole portions 31III are spaced apart in a transverse direction of the first sole member 20I. Each of the left and right sole portions



311III has a flange 311III projecting from the second sole member 30III to the first and third sole members 20I and 40I. In assembly, the flanges 311III of the left and right sole portions 311III extend around the peripheral ends of the first and third sole members 20I and 40I. A gap 33III is formed between the left and right sole portions 311III, and the front and rear protrusions 21I and 41I of the first and third sole members 20I, 40I extend between the flanges 311III in the gap 33III. By changing the width of the gap 33III, the second sole member 30III can be adjusted to be adaptable to different uppers which are of the same length but different in width. In view of this embodiment, the present invention also provides a second sole member which can be adjusted to be adaptable to the dimensions of shoes that have the same size number but different widths.

While the present invention has been described in connection with what is considered the most practical and preferred embodiments, it is understood that this invention is not limited to the disclosed embodiments but is intended to cover various arrangements included within the spirit and scope of the broadest interpretations and equivalent arrangements.